Predicting and Monitoring Collision in Helmets Using Microcontroller and Sensor Array

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Concussions are dangerous injuries that can have immediate as well as long term effects. They have been shown to cause dizziness, confusion, and loss of consciousness in the short term and sleep disorders, memory issues, and depression in the long term. This type of injury has become a prevalent issue today. Sports account for over 300,000 concussions per year with football, ice hockey, and lacrosse being among the chief offenders. However, there are many factors that mitigate the risk of concussion. In addition to proper protective equipment, research shows that the neck plays an important role in absorbing impact, reducing whiplash, and mitigating brain injury. It is imperative that the neck is involved before, during, and after a collision. Electronics that could predict a potential impact and then use that data to warn the wearer and activate additional safety gear could reduce injury significantly. To achieve this goal, a sensor array, which included distance sensors and an accelerometer, was connected to a microcontroller that analyzed the sensor data. The system has the ability to view activity outside of the helmet to predict potential collisions, and it can also monitor the changes in head acceleration, a major predictor of brain injury. Additionally, an attached Bluetooth module allows this system to communicate wirelessly with most mobile smart devices, which could be used to alert sideline medical staff or parents of a potential brain injury. A significant amount of testing in appropriate environments is needed to validate this system; however, it could reduce the threat of injury to many helmet wearers.

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